



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

NOTE ON THE n th DERIVATIVE OF A DETERMINANT WHOSE CONSTITUENTS ARE FUNCTIONS OF A GIVEN VARIABLE.*

By W. J. RUSK. Grinnell, Iowa.

Let the determinant be $D=(a_1 b_2 \dots l_r)$ where the a , b ,, l are functions of a variable t . Then

$$\frac{dD}{dt}=(a_1' b_2 \dots l_r) + \dots + (a_1 b_2 \dots l_r').$$

$$\frac{d^2 D}{dt^2}=(a_1'' b_2 \dots l_r) + \dots + (a_1 b_2 \dots l_r'')$$

$$+ 2(a_1' b_2' c_3 \dots l_r) + \dots + 2(a_1 b_2 \dots l_{r-1}' l_r').$$

Consider now the expansion

$$(a+b+c+\dots+l)^2=a^2 b^0 c^0 \dots l^0 + a^0 b^2 c^0 \dots l^0 + 2a^1 b^1 c^0 \dots l^0 + \dots$$

If we interpret the power of a^n as the n th derivative of a and write instead of $a^1 b^0 c^0 \dots l^0$ the expression $(a_1'' b_2 c_3 \dots l_r)$, etc., we have, symbolically,

$$\frac{d^2 D}{dt^2}=(a+b+c+\dots+l)^2.$$

Suppose now that, symbolically,

$$\frac{d^{n-1} D}{dt^{n-1}}=(a+b+c+\dots+l)^{n-1}=\sum \frac{(n-1)!}{a! \beta! \dots \lambda!} a^a b^\beta \dots l^\lambda,$$

where $a+\beta+\gamma+\dots+\lambda=n-1$.

Now suppose the symbolic form be interpreted as before and another differentiation with respect to t carried out. Then the coefficient of $a^a b^\beta \dots l^\lambda$ will be

$$C=\frac{n!}{a'! \beta'! \dots \lambda'!},$$

where $a'+\beta'+\dots+\lambda'=n$. For this term can be obtained by differentiation from terms with exponents one less than a' , β' ,, or λ' , and its coefficient will be

$$\frac{(n-1)!}{(a'-1)! \beta'! \dots \lambda'!} + \frac{(n-1)!}{a'! (\beta'-1)! \dots \lambda'!} + \dots = C.$$